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Himmelein et al.

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(54) **OVEN DOOR FOR A MICROWAVE OVEN OR A MULTIFUNCTIONAL OVEN WITH MICROWAVE HEATING FUNCTION**

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(Continued)

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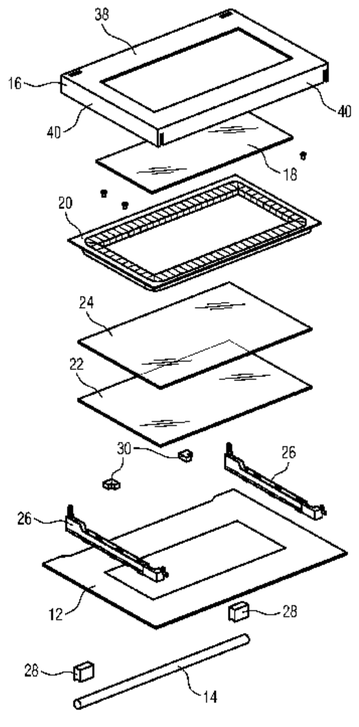
(57) **ABSTRACT**

An oven door for a microwave oven or a multifunctional oven with microwave heating function is provided. The oven door includes an outer glass panel and at least two door columns directly attached or attachable at an inner side of the outer glass panel. The oven door further includes a door cover arranged or arrangeable at an inner side of the outer glass panel and attached or attachable at the door columns. The oven door also includes a door choke system arranged or arrangeable between the door cover and the outer glass panel. The oven door further includes an inner glass panel arranged or arrangeable between the door cover and the door choke system.

16 Claims, 7 Drawing Sheets



(58) **Field of Classification Search**
USPC 219/739–744, 682; 126/20, 198
See application file for complete search history.

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FIG 1

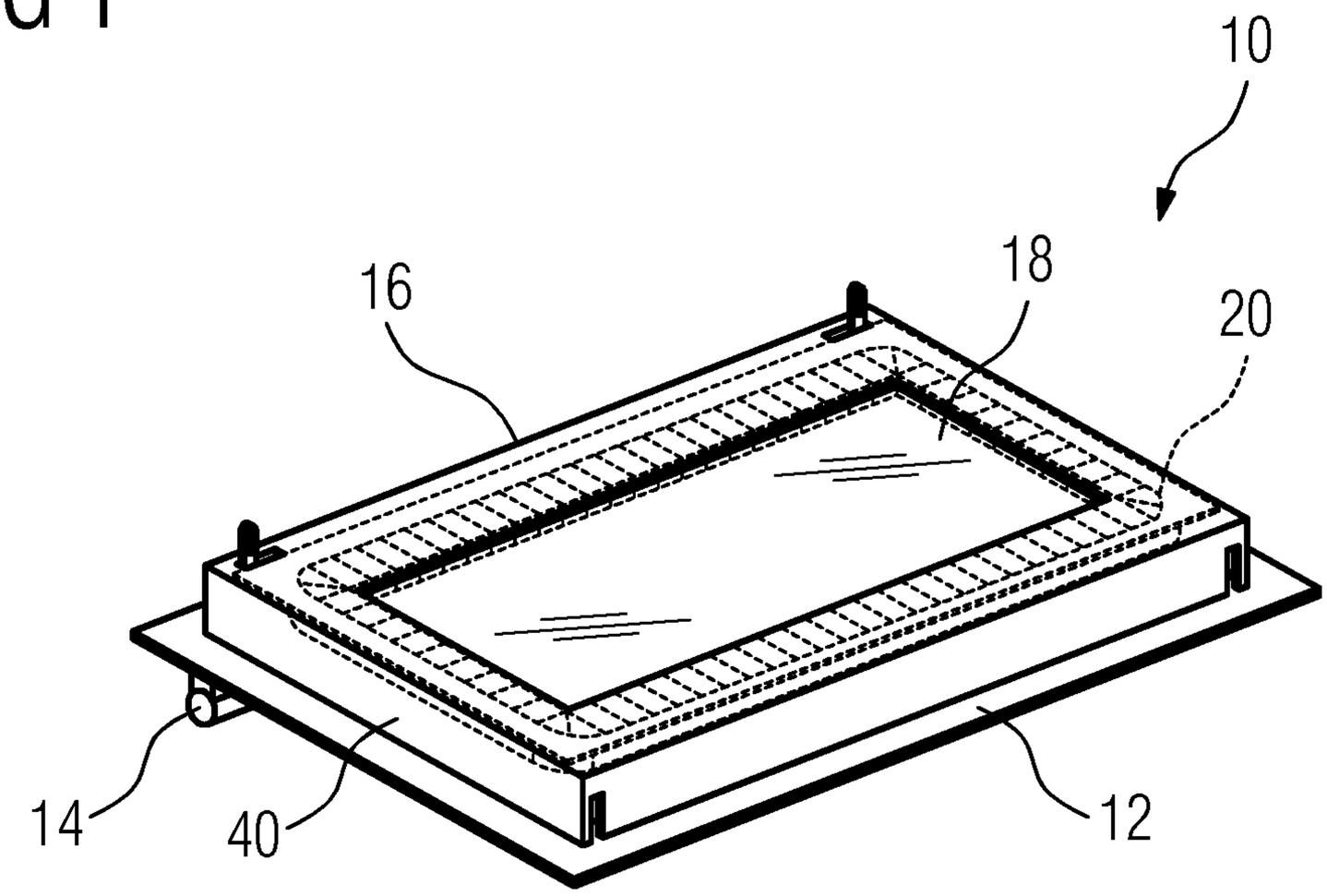
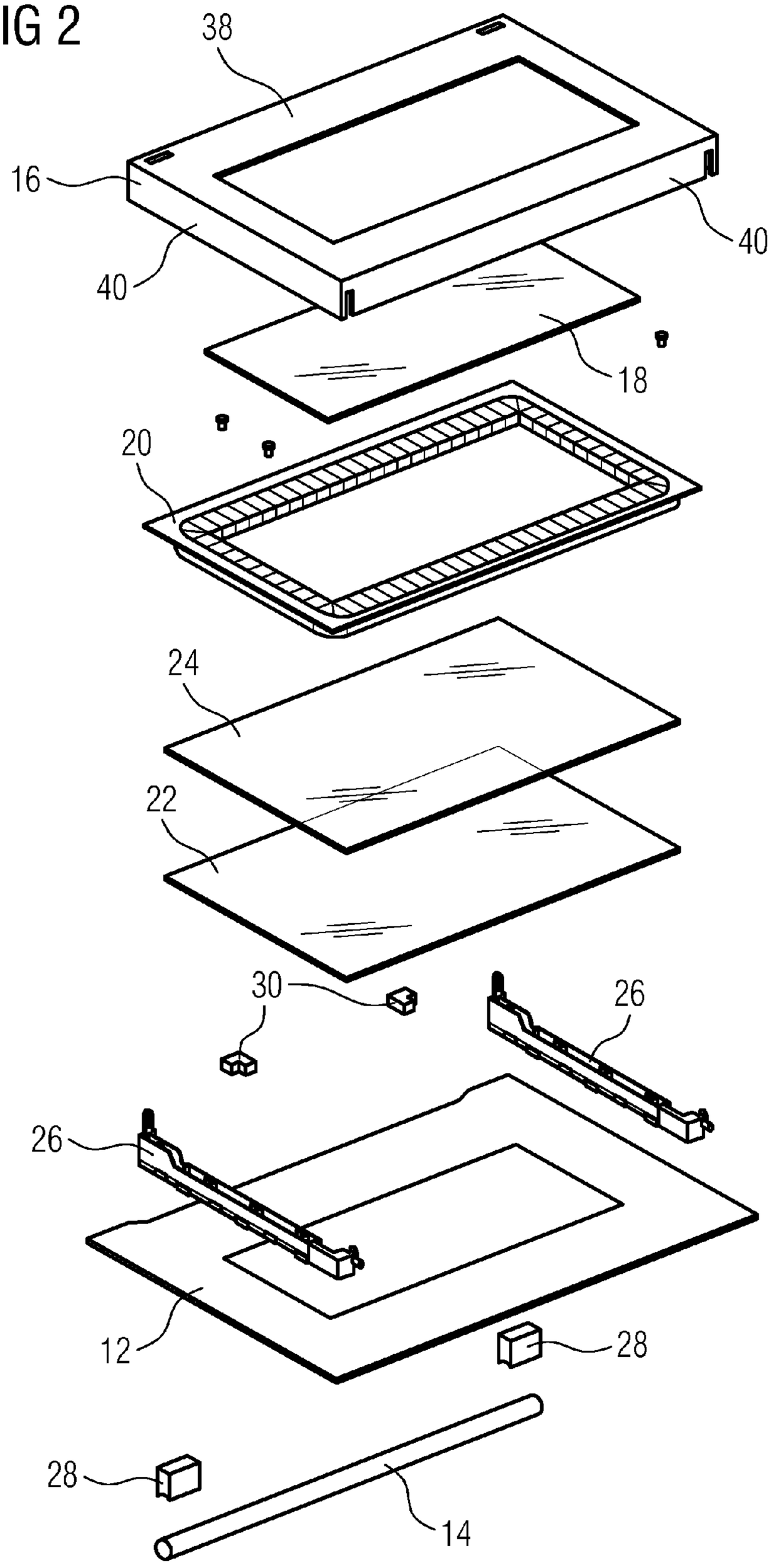


FIG 2



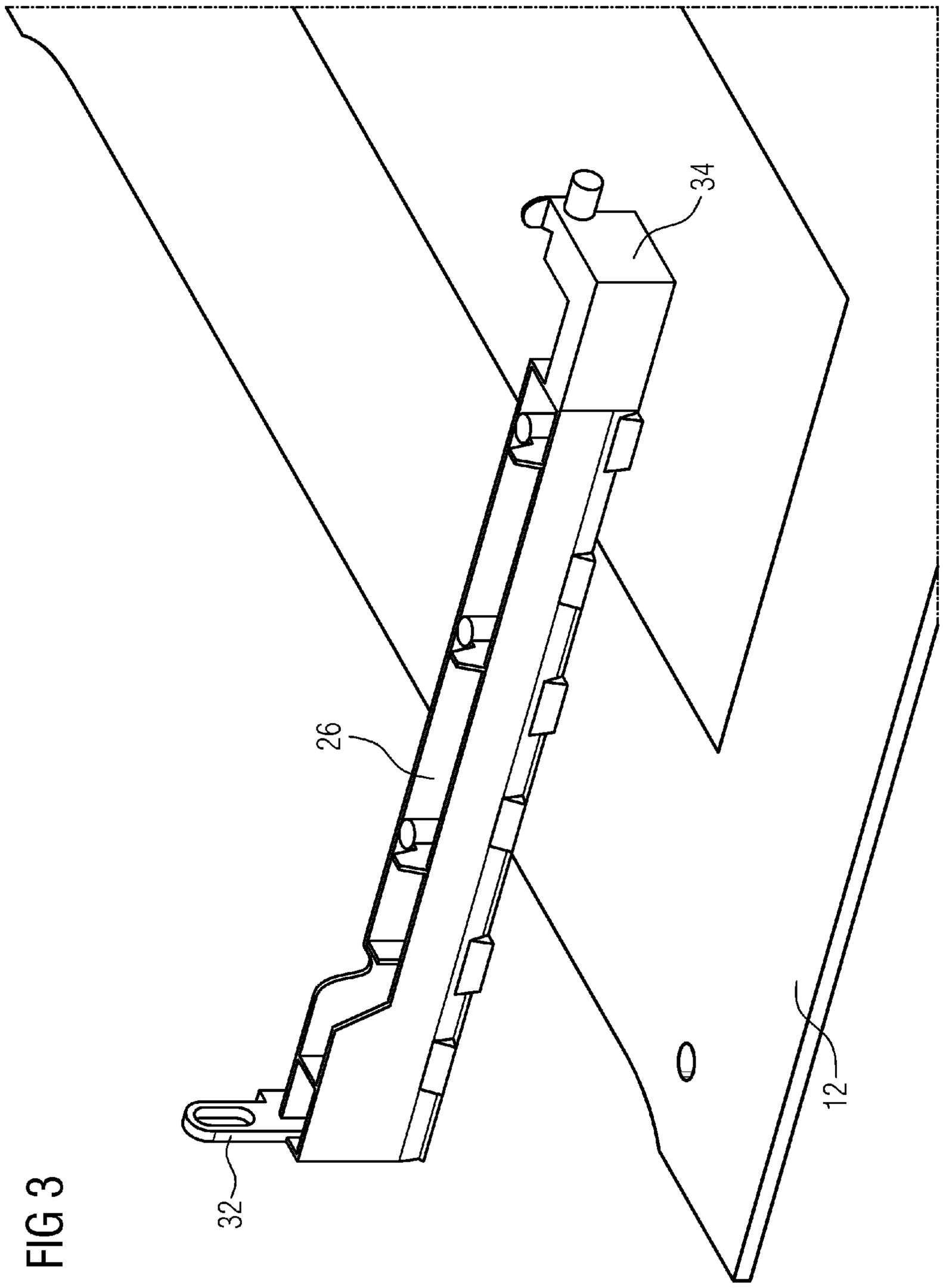


FIG 3

FIG 4

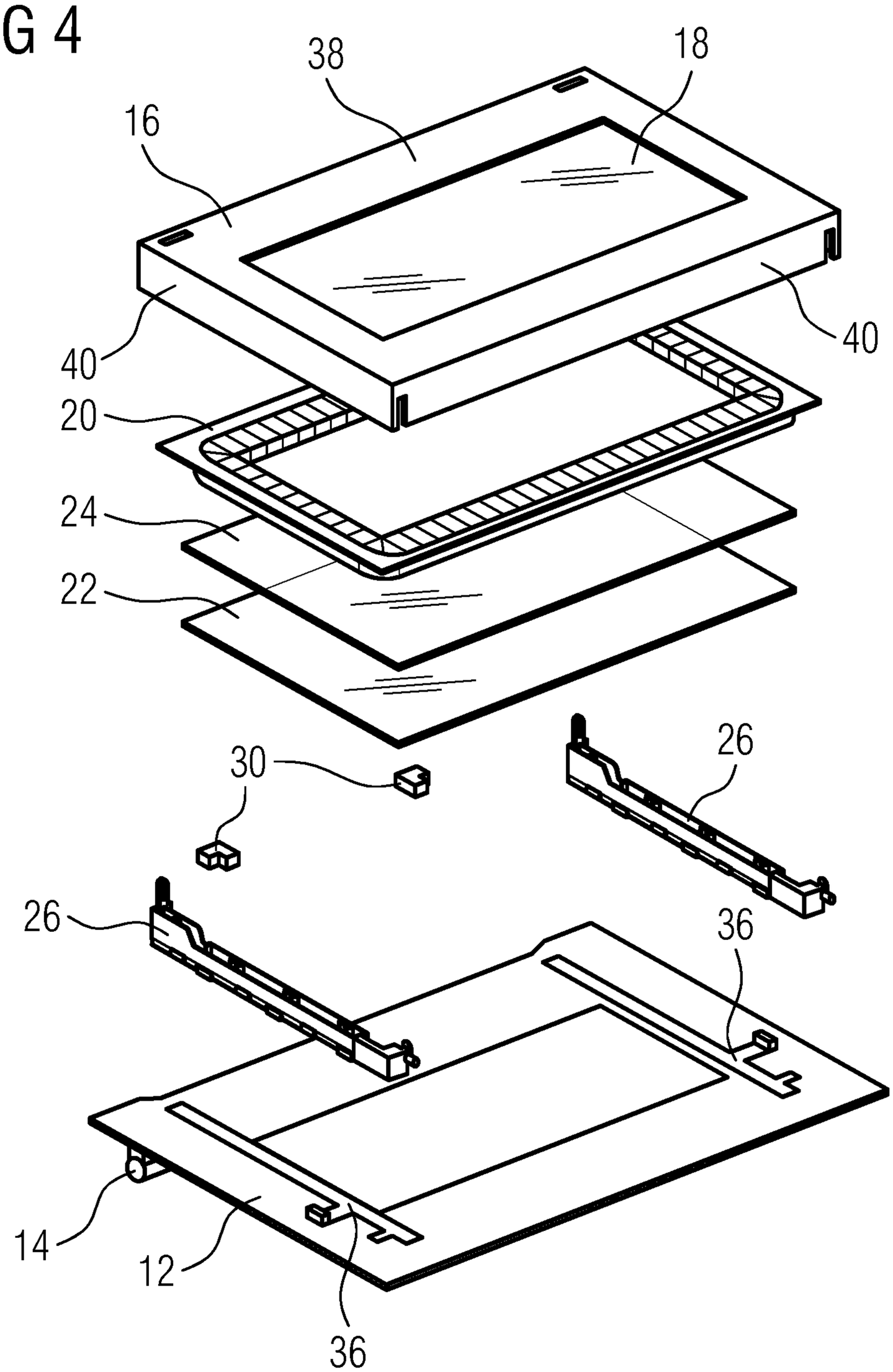


FIG 5

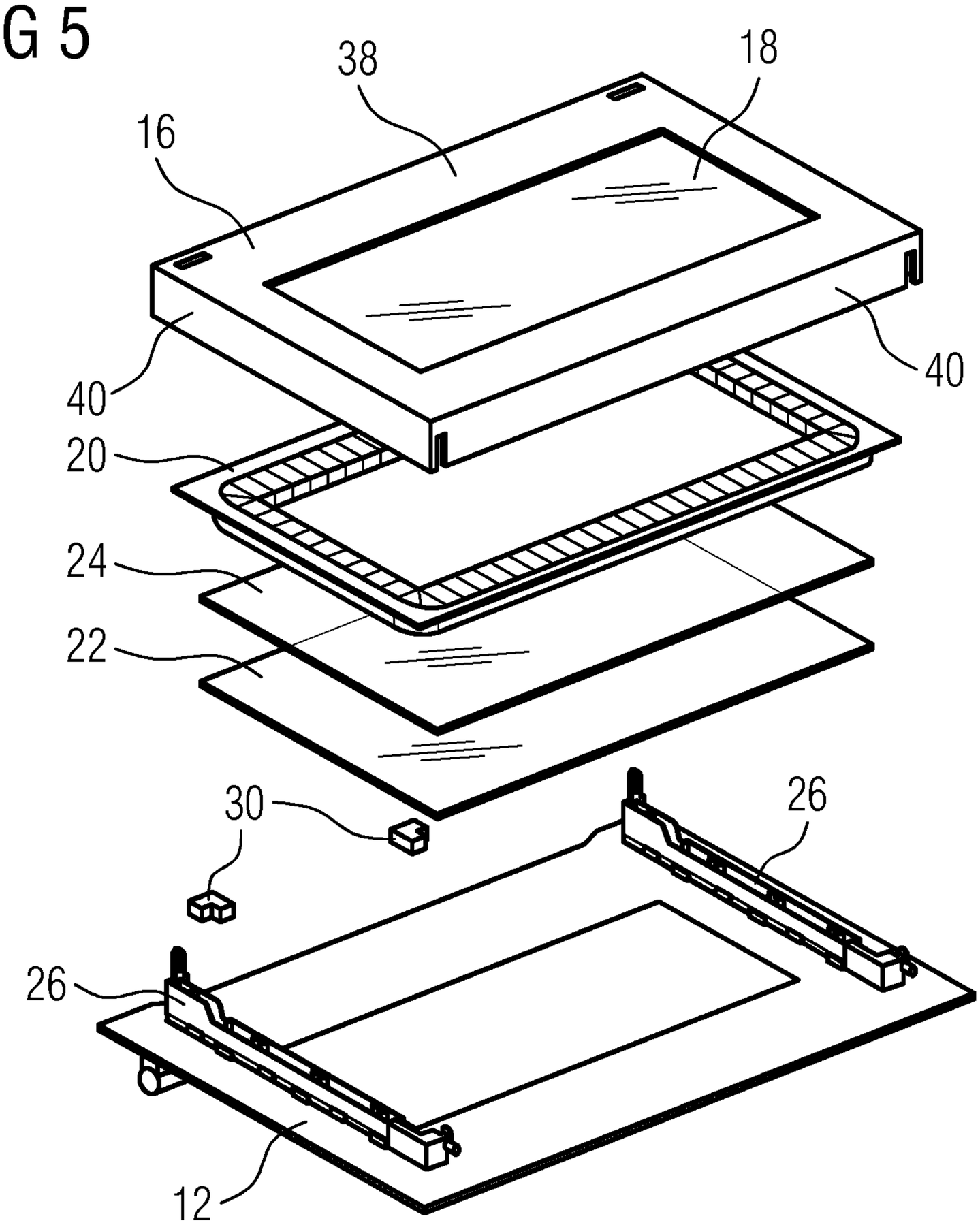


FIG 6

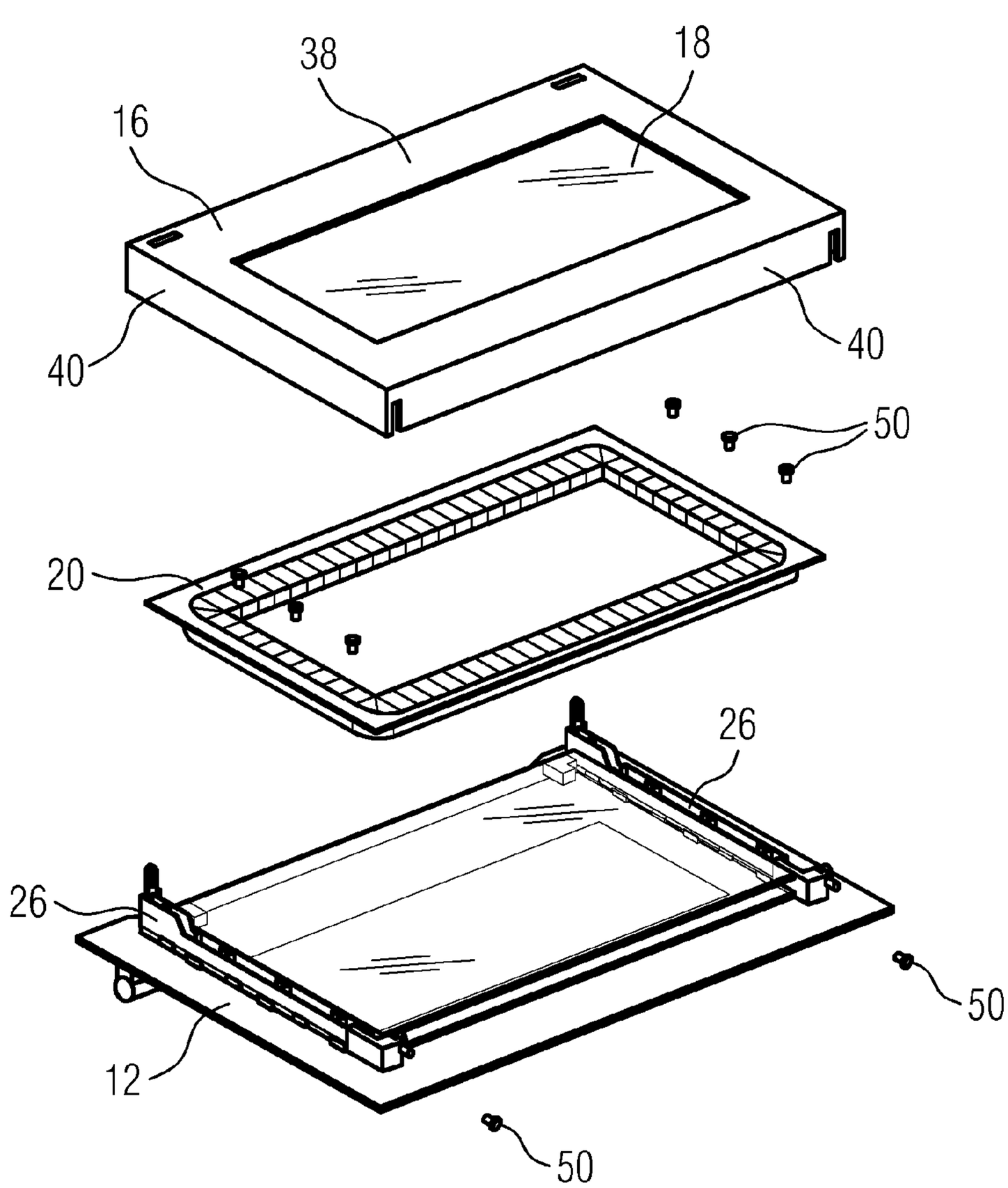
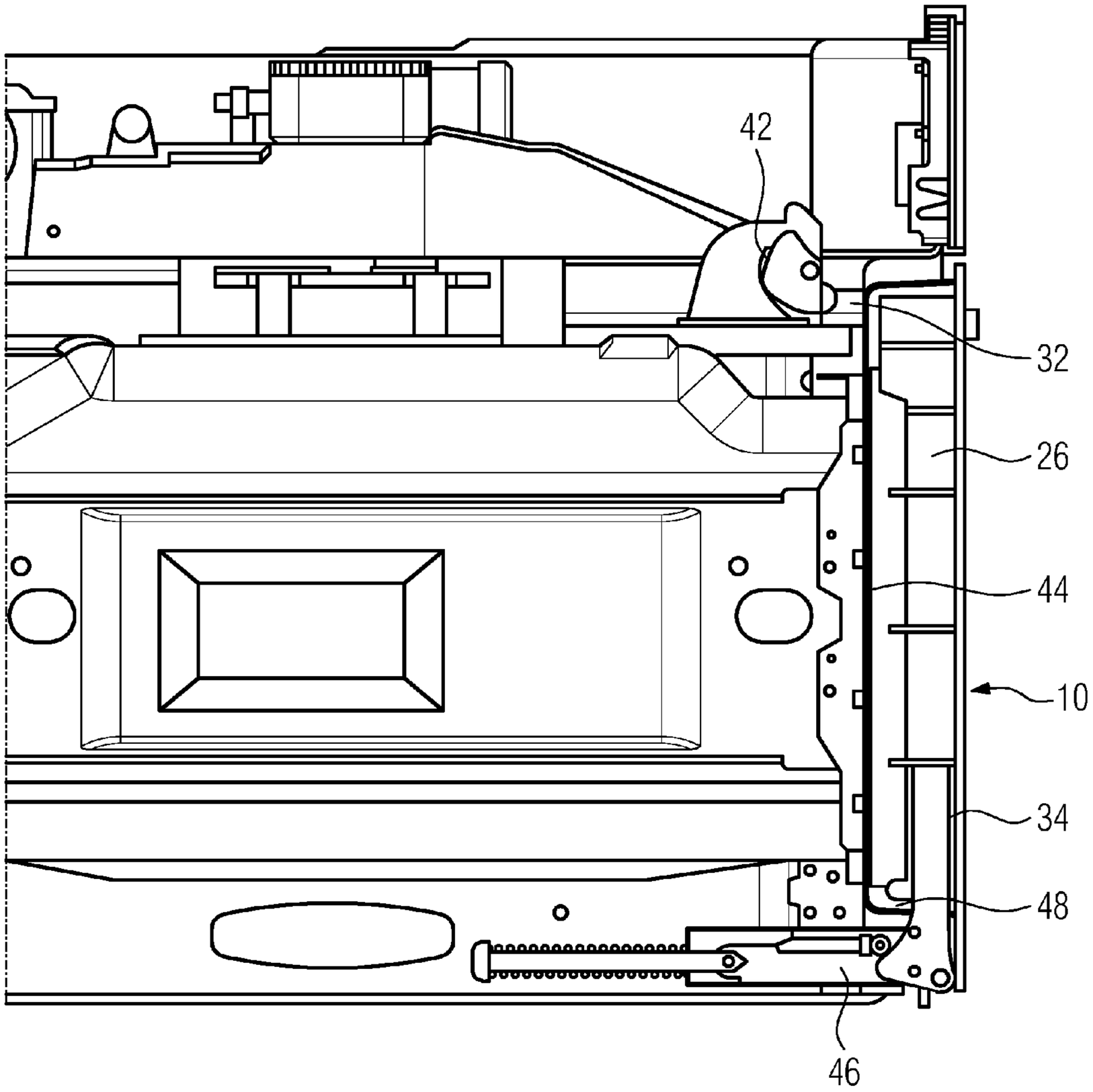


FIG 7



OVEN DOOR FOR A MICROWAVE OVEN OR A MULTIFUNCTIONAL OVEN WITH MICROWAVE HEATING FUNCTION

The present invention relates to an oven door for a microwave oven or a multifunctional oven with microwave heating function. Further, the present invention relates to a microwave oven or a multifunctional oven with microwave heating function.

In a microwave oven or a multifunctional oven with a microwave heating function the oven door requires different features. The oven door has to be attached pivoting at a front frame of the oven by hinges. The hinges are often arranged inside the oven door and fixed by screws. One or two latches in an upper portion of the oven door are parts of a safety interlock system, wherein the other part of said safety interlock system is arranged in the top portion of the front frame. The latches are engageable with said parts in the front frame. Further, a wave choke system is required in order to prevent a microwave leakage. The components of the oven door usually require a lot of fixing elements.

It is an object of the present invention to provide an oven door for a microwave oven or a multifunctional oven with microwave heating function, wherein the oven door is constructed by low complexity.

The object of the present invention is achieved by the oven door according to claim **1**.

The present invention relates to an oven door for a microwave oven or a multifunctional oven with microwave heating function, wherein

- the oven door comprises an outer glass panel,
- the oven door comprises at least two door columns directly attached or attachable at an inner side of the outer glass panel,
- the oven door comprises a door cover arranged or arrangeable at an inner side of the outer glass panel and attached or attachable at the door columns,
- the oven door comprises a door choke system arranged or arrangeable between the door cover and the outer glass panel, and
- the oven door comprises an inner glass panel arranged or arrangeable between the door cover and the door choke system.

The main idea of the present invention is the direct attachment of the door columns at the inner side of the outer glass panel on the one hand and the attachment of door cover at the door columns on the other hand, wherein the remaining components of the oven door are arranged between the outer glass panel and the door cover. This constellation allows a compact structure of the oven door and reduced the number of fixing elements. Thus, the oven door may be constructed by low complexity.

According to a special embodiment of the present invention the door columns are glued by an adhesive at the inner side of the outer glass panel. This simplifies the production of then oven door.

Alternatively, the door columns may be attached or attachable by screws at the inner side of the outer glass panel.

In particular, the door columns are made of plastics. This contributes to low costs.

For example, the door choke system includes at least one metal sheet with a circumferential channel.

Preferably, the door choke system includes at least one further metal sheet with a plurality of lamellae along the circumferential channel.

In particular, the door choke system includes a door grid in its central portion. The door grid allows shielding of microwave on the one hand and a transparent oven door on the other hand.

Further, the door choke system is fixed or fixable at the door columns. For example, the door choke system is fixed or fixable by screws at the door columns.

According to a preferred embodiment of the present invention the door cover includes a main wall extending in parallel to the inner glass panel and a circumferential wall perpendicular to said main wall.

In this case, the main wall of the door cover may include a recess in its centre, so the inner glass panel and the door cover form a window with an enclosing frame.

Moreover, at least one central glass panel may be arranged or arrangeable between the door columns on the one hand and between the outer glass panel and the door choke system on the other hand.

Preferably, the at least one central glass panel is aligned by retaining elements.

Further, the door column may include at least one latch element engageable with a safety interlock system of the oven.

For example, the door column and the latch element are formed as a single-piece part.

Alternatively, the latch element may be made of metal and inserted by moulding into the door column.

In particular, the door column includes a recess for receiving a hinge arm of a door hinge.

Preferably, the oven door comprises a door handle fixed or fixable at an outer side of the outer glass panel.

Further, the present invention relates to a microwave oven or a multifunctional oven with microwave heating function, wherein the oven comprises an oven door mentioned above.

Novel and inventive features of the present invention are set forth in the appended claims.

The present invention will be described in further detail with reference to the drawings, in which

FIG. **1** illustrates a perspective view of an oven door for a microwave oven or a multifunctional oven with microwave heating function according to a preferred embodiment of the present invention,

FIG. **2** illustrates an exploded perspective view of the oven door for the microwave oven or multifunctional oven with microwave heating function according to the preferred embodiment of the present invention,

FIG. **3** illustrates a detailed exploded perspective view of a door column and an outer glass panel of the oven door for the microwave oven or multifunctional oven with microwave heating function according to the preferred embodiment of the present invention,

FIG. **4** illustrates a further exploded perspective view of the oven door for the microwave oven or multifunctional oven with microwave heating function according to the preferred embodiment of the present invention,

FIG. **5** illustrates another exploded perspective view of the oven door for the microwave oven or multifunctional oven with microwave heating function according to the preferred embodiment of the present invention,

FIG. **6** illustrates a further exploded perspective view of the oven door for the microwave oven or multifunctional oven with microwave heating function according to the preferred embodiment of the present invention, and

FIG. **7** illustrates a sectional side view of the oven door arranged at the microwave oven or multifunctional oven with microwave heating function according to the preferred embodiment of the present invention.

FIG. **1** illustrates a perspective view of an oven door **10** for a microwave oven or a multifunctional oven with microwave heating function according to a preferred embodiment of the present invention.

The oven door **10** comprises an outer glass panel **12**, a door handle **14**, a door cover **16**, an inner glass panel **18**, a door choke system **20**, a first central glass panel **22**, a second central glass panel **24** and two door columns **26**.

The door handle **14** is attached at an outer side of the outer glass panel **12**. The door cover **16** is attached at an inner side of the outer glass panel **12**. The door cover **16** includes a main wall **38** and circumferential side walls **40**, so that a space is formed between said door cover **16** and the outer glass panel **12**. The inner glass panel **18**, the door choke system **20**, the first central glass panel **22**, the second central glass panel **24** and the two door columns **26** are arranged inside said space. The main wall **38** of the door cover **16** includes a cutout, so that the door cover **16** and the inner glass panel **18** form a window with frame.

FIG. **2** illustrates an exploded perspective view of the oven door **10** for the microwave oven or multifunctional oven with microwave heating function according to the preferred embodiment of the present invention. FIG. **2** clarifies the arrangement and positions of the components of the oven door **10**.

The door handle **14** is attached via distance elements **28** at an outer side of the outer glass panel **12**. The door columns **26** are attached at the inner side of the outer glass panel **12**. The first central glass panel **22** and the second central glass panel **24** are arranged between the door columns **26**. Retaining elements **30** are provided for the alignment of the first central glass panel **22** and the second central glass panel **24**. The inner glass panel **18** is attached at an outer side of the door cover **16**. The door choke system **20** is arranged between the inner glass panel **18** and the second central glass panel **24**.

FIG. **3** illustrates a detailed exploded perspective view of the door column **26** and the outer glass panel **12** of the oven door **10** for the microwave oven or multifunctional oven with microwave heating function according to the preferred embodiment of the present invention.

The door column **26** is elongated and provided for a vertical arrangement at the inner side of the outer glass panel **12**. The two door columns **26** are arranged side-by-side and in parallel at the outer glass panel **12**. The first central glass panel **22** and the second central glass panel **24** are arranged between said two door columns **26**.

The door column **26** includes a latch element **32** at its upper end. The latch element **32** is an integrated part of the door column **26**. For example, the latch element **32** and door column **26** may form a single-piece part. In this case, the door column **26** with latch element **32** is preferably made of plastics. Further, the latch element **32** may be made of metal and inserted by moulding into the door column **26** made of plastics. The latch element **32** is engageable with a safety interlock system **42** of the oven. In a closed state of the oven door **10** the latch element **32** is engaged with the safety interlock system **42** arranged in an upper portion behind a front frame of the oven.

A recess **34** in the lower portion of the door column **26** is provided for receiving a hinge arm of a door hinge. The oven door **10** is fixable at the oven by inserting two hinge arms of the door hinge into the door columns **26** of the oven door **10**.

FIG. **4** illustrates a further exploded perspective view of the oven door **10** for the microwave oven or multifunctional oven with microwave heating function according to the preferred embodiment of the present invention. FIG. **4** shows a step during assembling the oven door **10**.

An adhesive **36** is applied on those areas of the inner side of the outer glass panel **12**, which are provided for the door columns **26**. The gluing of the door columns **26** onto the outer glass panel **12** simplifies the assembling of the oven door **10**. The first central glass panel **22** and the second central glass panel **24** are provided for the intermediate space between the door columns **26**. The retaining elements **30** allow the alignment of the first central glass panel **22** and the second central glass panel **24**.

The door cover **16** may be fixable at the door columns **26** by screws and/or by a snap-in mechanism. The inner glass panel **18** and the door choke system **20** are arranged between the door cover **16** and the second central glass panel **24**.

FIG. **5** illustrates another exploded perspective view of the oven door **10** for the microwave oven or multifunctional oven with microwave heating function according to the preferred embodiment of the present invention. FIG. **5** is similar to FIG. **4**, wherein the door columns **26** are glued onto the outer glass panel **12**.

FIG. **6** illustrates a further exploded perspective view of the oven door **10** for the microwave oven or multifunctional oven with microwave heating function according to the preferred embodiment of the present invention. FIG. **6** is similar to FIG. **5**, wherein the first central glass panel **22** and the second central glass panel **24** are already inserted between the door columns **26**.

In this example, the door choke system **20** is made of two metal sheets. An outer metal sheet includes a circumferential channel for a wave trap. An inner metal sheet includes a plurality of lamellae for the wave trap.

Screws **50** may be provided for fixing the door cover **16** at the door columns **26**. Further, the screws **50** may be provided for connecting the inner metal sheet of the door choke system **20** to the outer metal sheet of said door choke system **20**. Moreover, the screws **50** may be provided for connecting the door choke system **20** to the door columns **26**.

FIG. **7** illustrates a sectional side view of the oven door **10** arranged at the microwave oven or multifunctional oven with microwave heating function according to the preferred embodiment of the present invention.

The oven door **10** is arranged in front of a front frame **44** of the oven. FIG. **7** clarifies the arrangement of the door column **26** inside the oven door **10**. The latch element **32** is an integrated part of the door column **26**. The latch element **32** is engaged with the safety interlock system **42** arranged behind the upper portion of the front frame **44**.

The door hinge **46** is arranged at the oven below the front frame **44**. The hinge arm **48** of the door hinge **46** is received by the recess **34** of the door column **26**. The oven door **10** is easily fixable at the oven by inserting two hinge arms **48** of the door hinge **46** into the door columns **26** of the oven door **10**.

Although an illustrative embodiment of the present invention has been described herein with reference to the accompanying drawings, it is to be understood that the present invention is not limited to that precise embodiment, and that various other changes and modifications may be affected therein by one skilled in the art without departing from the scope or spirit of the invention. All such changes and modifications are intended to be included within the scope of the invention as defined by the appended claims.

LIST OF REFERENCE NUMERALS

10 oven door
12 outer glass panel

14 door handle
16 door cover
18 inner glass panel
20 door choke system
22 first central glass panel
24 second central glass panel
26 door column
28 distance element
30 retaining element
32 latch element
34 recess
36 adhesive
38 main wall
40 circumferential wall
42 safety interlock system
44 front frame
46 door hinge
48 hinge arm
50 screw

The invention claimed is:

1. An oven door for a microwave oven or a multifunctional oven with microwave heating function, said oven door comprising:

an outer glass panel,

at least two door columns directly attached at an inner side of the outer glass panel,

a door cover arranged at the inner side of the outer glass panel and attached at the door columns,

a door choke system arranged between the door cover and the outer glass panel, and

an inner glass panel arranged between the door cover and the door choke system,

wherein the door cover includes both a main wall extending in parallel to the inner glass panel and a circumferential side wall perpendicular to said main wall, said main wall and said circumferential side wall forming a space between the door cover and the outer glass panel, and

wherein the inner glass panel, the door choke system, and the two door columns are arranged inside said space.

2. The oven door according to claim **1**,

wherein

the door columns are glued by an adhesive at the inner side of the outer glass panel or in that the door columns are attached by screws at the inner side of the outer glass panel.

3. The oven door according to claim **1**,

wherein

the door columns are made of plastics.

4. The oven door according to claim **1**,

wherein

the door choke system includes at least one metal sheet with a circumferential channel.

5. The oven door according to claim **4**,

wherein

the door choke system includes at least one further metal sheet with a plurality of lamellae along the circumferential channel.

6. The oven door according to claim **4**,

wherein

the door choke system includes a door grid in its central portion.

7. The oven door according to claim **1**,

wherein

the door choke system is fixed by screws at the door columns.

8. The oven door according to claim **1**,

wherein

the main wall of the door cover includes a recess in its centre, so the inner glass panel and the door cover form a window with an enclosing frame.

9. The oven door according to claim **1**,

wherein

at least one central glass panel is arranged between the door columns on the one hand and between the outer glass panel and the door choke system on the other hand.

10. The oven door according to claim **9**,

wherein

the at least one central glass panel is aligned by retaining elements.

11. The oven door according to claim **1**,

wherein

the door column includes at least one latch element configured to engage with a safety interlock system of the oven.

12. The oven door according to claim **11**,

wherein

the door column and the latch element are formed as a single-piece part or in that the latch element is made of metal and inserted by moulding into the door column.

13. The oven door according to claim **1**,

wherein

the door column includes a recess for receiving a hinge arm of a door hinge.

14. The oven door according to claim **1**, further comprising a door handle fixed at an outer side of the outer glass panel.

15. The oven door according to claim **14**, wherein the door handle is fixed at the outer side of the outer glass panel via distance elements.

16. A microwave oven or a multifunctional oven with microwave heating function,

said

oven comprising an oven door according to claim **1**.

* * * * *